KEMENTERIAN PENDIDIKAN TINGGI

JOJAPS

eISSN 2504-8457

POLITEKNIK MALAYSIA PORT DICKSON

Journal Online Jaringan Pengajian Seni Bina (JOJAPS)

Efficient Temperature Control and Monitoring System Based Internet of Things

Isma Shamsuria binti Ismail, Nabilah binti Mazalan & Hafidah binti Mahat

Department of Electrical Engineering, Polytechnic Merlimau, Malacca, MALAYSIA
Corresponding Author: ismashamsuria@gmail.com

Abstract.
The internet landscape and network are burgeoning. It is not about the escalating development of laptops and smartphones anymore, but it is more about how these devices are connected through the internet successfully. This paper presents the development of the Internet of Things (IoT) relationship in computer networking by implementing the Arduino microcontroller device. In this project, the Blynk application will monitor the surrounding temperature and humidity by using an internet connection through wireless device NodeMCU ESP8266 Arduino microcontroller. This project aims to show a small device NodeMCU microcontroller as wireless internet. The objective is to implement the Blynk application for IoT technology by monitoring temperature and humidity remotely for this project. Besides, this project has also been designing to show that IoT gives insight into how consumers integrate technology into their daily lives. The sensors and the smartphone are connected wirelessly as long as there is an internet connection for the devices. As a result, this project's output can be seen on the smartphone from the Blynk application by internet connection. The Blynk application has been successfully controlled the fan at the circuit and monitors the temperature and humidity from DHT 11 sensor. The NodeMCU device has collected the output and send it to the Blynk application every second. Based on the tests performed, this system's design has worked well as been planning. Graph-like temperature display on Blynk application successfully shows actual ambient temperature data average of 26°C, as well as a fan, will be ON automatically if the temperature exceeds 25°C and vice versa. Finally, this project proved that computer networking technology has been moving frontward increased with the contribution in the IoT world throughout Arduino devices.

Key-word: *IoT, ESP8266 Wi-Fi module, Blynk application, Humidity, Temperature*

1 Introduction

Today's technological advances are evolving ~~so~~ rapidly that everyone is regularly using technology in carrying out activities, especially technologies related to control, because people are always looking for controls that can facilitate all activities (Wicaksono, 2017). This is proven by using a smartphone for most life activities, including education, health, sports, and security (S. Mandal, 2015). With smartphone development rapidity dumping that attending with application that always sophisticated his function, the internet user will now control life at the fingertips.

According to (J. Jegathesh, 2019), Internet of Things (IoT) is a new technology that offers many applications to connect the stuff with things and peoples through the Internet networking. Every object in the system that humans use can be identified, connected through the Internet to make decisions independently. There is an increase awareness and adoption of IoT solution currently. Compare to 10 years ago, the internet wireless module nowadays become cheaper, powerful yet smaller. With the technology of IoT, the devices that have been used become tiny, innovative, and more straightforward. In numerous literatures, NodeMCU is a microcontroller device that has built in Wi-Fi module ESP8266 so that it can operate itself without the existence of any microcontroller board (Bento, 2018). This project intended to show that wireless Internet can be used by small NodeMCU devices and implement the Blynk application for IoT technology by monitoring the temperature and humidity remotely. Besides, this project has also been designed to show that IoT gives insight into how consumers integrate technology into their daily lives. In this paper, an application in the smartphone has been used which is the Blynk App that operates to control the NodeMCU board via the Internet. (Todica, 2016). In this study, the NodeMCU ESP8266 serves as a client and controller for a fan.

NodeMCU ESP8266 will receive input from the sensor to control the fan by DHT11 sensor conditions and send condition data to the server to determine the active sensor. While on the server-side, this system runs remote monitoring and controls systems temperature and humidity of the environment connected via the Internet to the smartphone using Blynk application without being limited by space and time. This paper introduces that devices to control some sensors are no longer massive, despite the device becoming smaller and becoming very efficient.

2.0 Literature Review

The IoT can be described as connecting everyday objects such as smartphones, internet TVs, sensors, and actuators to the Internet, where devices are connected that allow new communication forms between them and people and between itself. IoT's beauty is a smart connection between many network devices, sensors, electronics, software, and people connected using the Internet (M. M. Raikar, 2018).

G. Joga Rao (2018) has proposed temperature-controlled fan using using IoT. This fan designed for reducing the manual operation of fan that is altering the speed of fan automatically. Shaik Anwar (2016) has proposed an IoT based smart homes security system with alert and door access control using smart phone. This paper presents the design and the implementation of an interactive smart home security system with email alert, web enabled video streaming and remote control of voice alert and door accessing system. A study based on Thingspeak Based Sensing and Monitoring System for IoT with Matlab Analysis was provided by Sharmad Pasha (2016). This project proves the strength of IoT using the Thinkspeak API that capable to contribute the services for the purpose of bulding vast number of IoT applications and help to implement them on the public platform.

Regarding to the discussed literature review, we can see that IoT has the ability application in wide area of science and technology including computing, mobile charging application, smart homes and many more. As the IOT able to allow an accurate picture of everything, IoT has the potential to add a new dimension to this process by enabling communications with and among smart objects, thus leading to the vision of anytime, anywhere, any media as well as any, communications medium (Aditya, 2020).

2.1 Component of IoT

IoT technology requires several components to complete an IoT application developed. It starts with hardware connected such as digital sensors, actuators that function to generate data and sense environment according to the needs of applications connected to the internet. In this section the middleware component will act as IoT platform that serves as a database and data analysis delivered to it. Users will interact through different applications interface. The IoT elements involved are unique identity features for all smart hardware, sensor hardware, communication technologies such as RFID, Bluetooth, Wi-Fi and others. In the IoT architecture middleware represents the both storage and analytical tools. Besides, data storage is required because IoT hardware will produce a lot of data.

There are many advantages using IoT in daily life. It covers all areas from lifestyle to business. Among the advantages offered by the IoT is performance improvement. This factor can increase efficiency and productivity becomes higher. Besides, the use of IoT can save costs, time and materials as well as save costs and resources. The use of IoT is also seen to provide new revenue streams and further develop new business models and market segments as well as provide added value to current products. The products produced become more innovative with new ideas that are more creative while utilizing the latest technology (Mazlan, 2020).

3 Methodology

The project uses NodeMCU as the microcontroller to link with the Blynk Application throughout the authentication token. NodeMCU is the Wi-Fi module connected to any internet connection. In contrast, Blynk Application will be connected to the smartphone using a Wi-Fi connection or any Internet Service Provider (ISP). The source code for this project is using Arduino IDE and has been uploading to the NodeMCU.

3.1 Project Diagram

The microcontroller of NodeMCU will be programmed using Arduino IDE by adding the name of SSID and password of internet access. The Blynk application eventually will relate to the NodeMCU through the project authentication token when the project at Blynk is creating. Figure 1 illustrated the connection of this project.

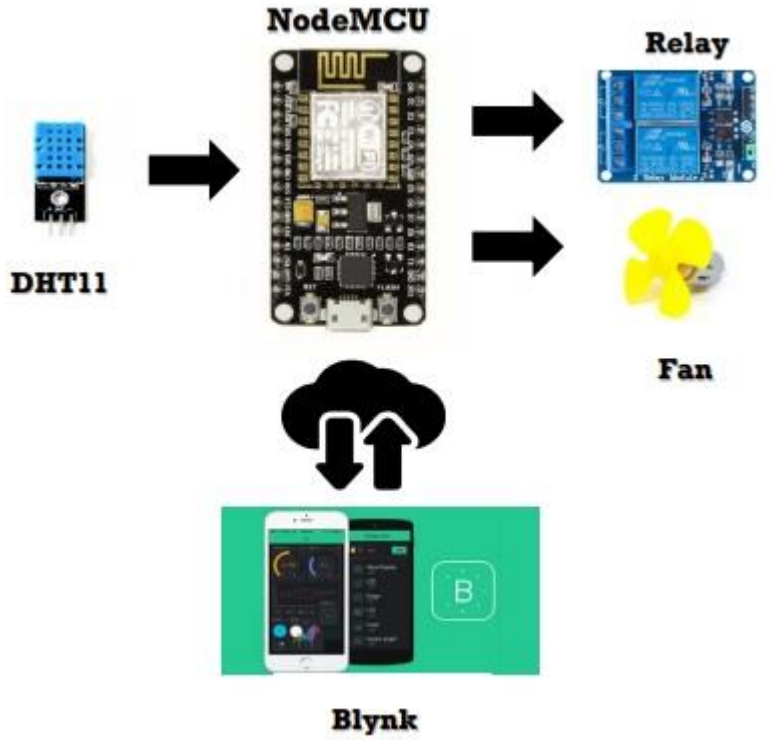


Figure 1: How Blynk and NodeMCU works

3.2 Hardware's Component

The components used in this project are including breadboard, jumper wires, NodeMCU, smartphone, DHT11 Temperature & Humidity Sensor, Relay, DC motor Fan, and micro USB cable. The breadboard has been used to organize all the components, and the NodeMCU used as the Wi-Fi module. Next, th Blynk Application was installed in the smartphone. The sensor type DHT11 is used to detect the temperature and humidity in surrounding. There is a cable used to connect the NodeMCU to the computer or laptop. Furthermore, the DC motor Fan will react to the surrounding weather as the relay will be switch ON or OFF the DC motor fan.

3.3 Software Design

The microcontroller that plays a role as the brain of this project must be programmed using the Arduino IDE. This project will modify the programming to get successful results. The other parts of software designing monitor the temperature to get the DHT11 sensor results using the Blynk Application.

3.4 Setup Blynk App

The set-up of the programming code throughout the Blynk Application is done as in the following steps:

a. Install Blynk from the Appstore/Playstore
b. Setting up Blynk App at the smartphone
c. Sign in and create a new project
d. Choose NodeMCU using Wi-Fi.
e. The 'auth token' will send to the email that have been register. The token must be the same with the programming that have been created.
f. The canvas at the Blynk is empty. Let's add the widget that is used during this project.
g. For the humidity and temperature sensor, the widget that been used is Gauge widget. The humidity is setting from 0 to 100 percent while the temperature sensor is set from 0 to 50 degree. This is shown in Figure 2.

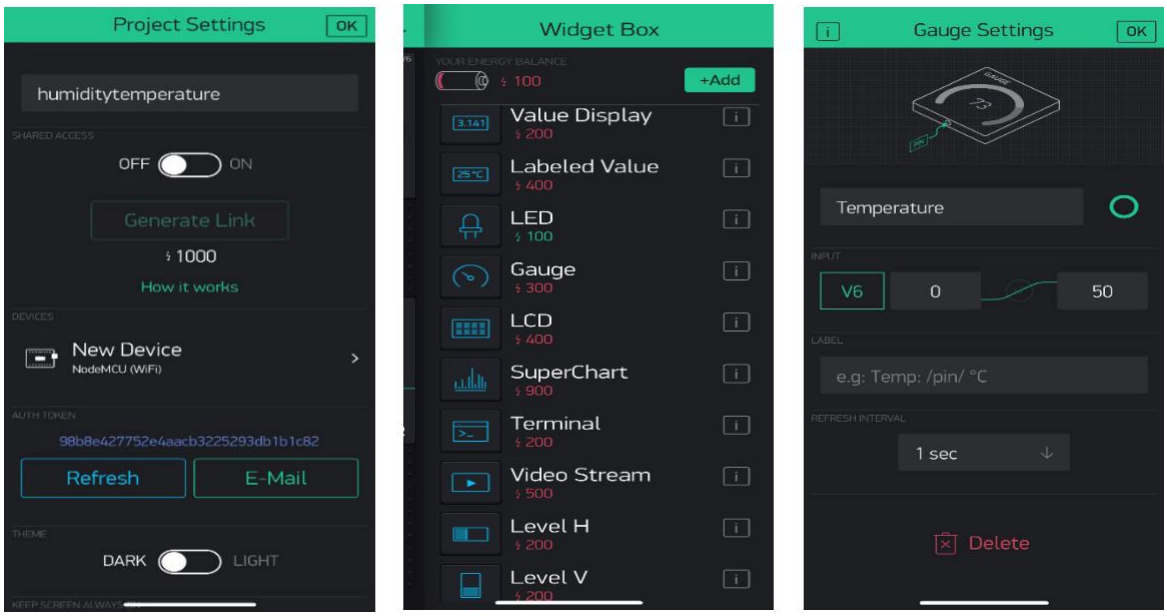


Figure 2 : Setup the Blynk App

4 Result and Discussion

After successfully setting the programming code to the constructed hardware, the system works and the output is observed. Sensor output data will be sent over the internet and it can be visualized on the Blynk application.

4.1 Monitoring the Temperature

The results which show the surrounding temperature and humidity detected by the DHT11 sensor can be observed at the Blynk Application on the smartphone. The button ON at the left side is for the fan, and the button ON at the right side is for the LED light. The graph in Figure 4 shows the pattern of the surrounding temperature at a particular time.

Figure 3: The Interface in Blynk Apps

Figure 4 : Pattern of Temperature

4.2 Auto ON OFF Fan

The diagram scheme for this project is as illustrated in Figure 5. This proposed system aims to obtain a small size system, easy to operate, and save costs. The main target of using this IoT-based system is for all communities. It uses Wi-fi technology that can operate the device automatically wherever it is.

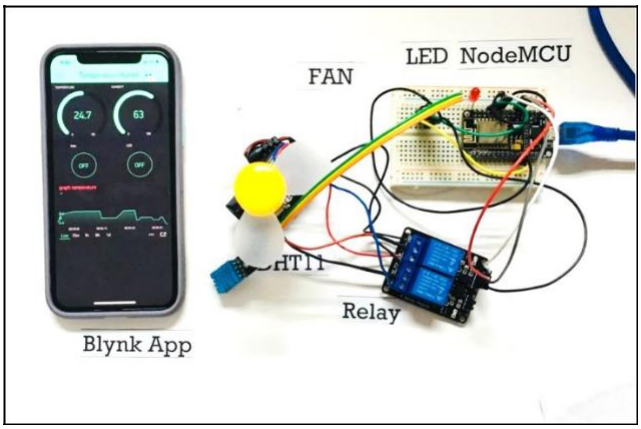
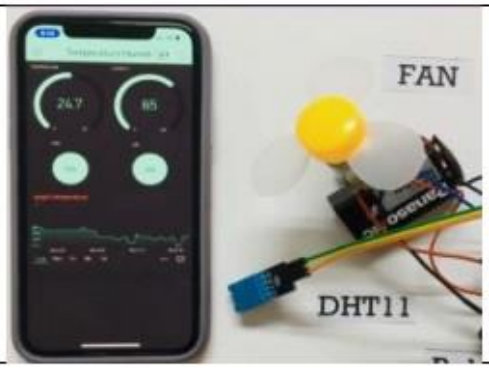
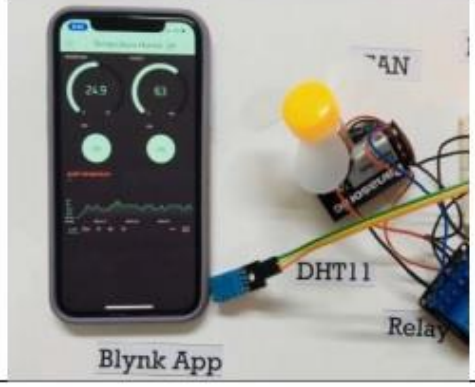


Figure 5: The scheme for the project

Table 1 shows the fan varies in response to changes in ambient temperature and humidity. The Fan is function as the output that reacts to the three conditions. For the first condition, the surrounding temperature reading by DHT11 is less than 25°C, the second condition is when the weather is more than 25°C, and the third condition is when the temperature drops from 25°C.

Table 1 : The Output for the fan

Value of Surrounding Temperature (°C)	Operation of the Fan
	The Fan is OFF if the temperature is less than 25°C.
	The Fan will Automatic ON when the temperature is more than 25 °C. The fan can be manually ON OFF using left ON button at Blynk App.
	When the temperature is drop from 25 °C, the fan will automatic OFF.

5 Conclusion

Based on the tests performed, it has been found that this system's design has worked well. NodeMCU can read all the inputs from the sensor. Preferably, a sensor electrically connected to NodeMCU is used to vary the fan in response to changes in ambient temperature and humidity. NodeMCU has successfully sent temperature data into the Blynk application. Besides, the graph-like temperature display on the Blynk application successfully shows the actual ambient temperature data average of 26°C, as well as the fan will be ON automatically if the temperature exceeds 25°C and vice versa. The temperature data generated in this study can be used to analyze environmental temperature trends. As a conclusion, IoT combines various sensing, controlling devices, and networking together for proper communication throughout this project. As a conclusion, the application of IOT can be developed in various field hence automation is also possible through IoT.

References

Aditya Tiwari et. Al (2020). *Internet of Things (IoT): Research, Architectures and Applications.* International Journal on Future Revolution in Computer Science & Communication Engineering. ISSN: 2454-4248, Volume-4, Issue-3, Pages (23-27)

Dede Kurniadi and Lia Amelia (2018), *"Sistem Kendali Perangkat Elektronik Rumah Berbasis Android dan Arduino",* algoritma, vol. 15, no. 2, pp. 37 - 42

Dr. J. Jegathesh Amalraj, S. Banumathi, J. Jereena John (2019), *IOT Sensors And Applications: A Survey*, International Journal of Scientific & Technology Research volume 8, issue 08

Dr. Mazlan Abbas (2020). *IoT notes*. Retrieved from http://bit.ly/MyIoTNotes

Joga Rao, G. Satish, D. Abhinav, P. Mothi Manoj Nageswara Rao, P. Satish Ganesh (2018), *Engineering and Technology 671 Temperature Controlled Fan using IOT* G. IJSRSET, Volume 4

M. M. Raikar, P. D. (2018). *Upsurge of IoT (Internet of Things) in engineering education: A case study.* International Conference on Advances in Computing, Communications and Informatics (ICACCI), (pp. 191-197).

Sharmad Pasha (2016). *Thingspeak Based Sensing and Monitoring System for IoT with Matlab Analysis.* International Journal of New Technology and Research (IJNTR) ISSN: 2454-4116, Volume-2, Issue-6, Pages 19-23

Shaik Anwar, D. Kishore (2016). *IOT based Smart Home Security System with Alert and Door Access Control using Smart Phone.* International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181 Vol.5 (pp. 504-509)

S. Mandal (2015). *Internet of Things (part 3), devices and technologies*, Retrieved from*:* http://www.c-sharpcorner.com/UploadFile/f88748/internet-of-things-iot-part-3/

Todica, M. (2016). *Controlling Arduino board with smartphone and Blynk via internet.* Retrieved from https://www.researchgate.net:
https://www.researchgate.net/profile/M_Todica/publication/310096021_Controlling_Ardui no_board_with_smartphone_and_Blynk_via_internet/links/5828c64c08ae5c0137f12699.p df

Wicaksono, M.F. (2017). *Implementasi Modul Wifi NodeMCU ESP8266 untuk Smart Home.* Jurnal Teknik Komputer Unikom-Komputika-Volume 6, No. 1